

IN THE CLAIMS:

Please rewrite claims 7, 11, 16, 52-54, 85, 90 and 91 as follows:

7. (Amended) A left ventricular or biventricular cardiac output restoration system for the treatment of heart failure that incorporates blood-pumping elements of sufficiently-compact size [and anatomic configuration to be implanted] configured to reside wholly within the natural heart, such that said pumping elements function independently or in conjunction with natural or prosthetic heart valves to provide the entire cardiac output required for the systemic (left) circulation and to provide all, none, or part of the cardiac output required for the pulmonic (right) circulation.

11. (Amended) The [electrically-powered intraventricular artificial heart] cardiac output restoration system of claim 7 which is electrically-powered [including] and includes an energy convertor and control means to vary the cardiac output produced according to physiological needs by varying the electrical power input into the energy-convertor.

16. (Amended) An electrically-powered intraventricular artificial heart, comprising:

(a) inflow means implantable within the heart to receive blood from the left or right atrium;

(b) blood pumping means configured to reside wholly [implantable] within the natural heart adapted to act upon blood received from the inflow means and eject

*(A3)*  
*concluded*

said blood at increased pressure into the aorta or pulmonary artery;

(c) electrical energy-converter means implantable within the heart adapted to receive electrical energy from a power source outside the heart via a cable and to convert said electrical energy to mechanical energy applied to pump the blood.

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52. (Amended) An artificial heart, heart assist, or blood pumping device adapted to propel blood therethrough by means of rotary hydrodynamic fluid pumping elements, comprising:

(a) inflow and outflow means by which to connect said device to the vascular system,

(b) blood containing housing means within which the pumping mechanism is contained,

(c) minimally-hemolytic axial flow, mixed flow, or centrifugal flow rotary pump impeller means, mechanically supported and rotated by a magnetically actuated rotor means,

(d) minimally-hemolytic wear-resistant blood-emersed journal bearing means supporting said rotor for rotation configured such that the exposed junction of the rotating and stationary components of the bearings [are] is washed by high enough blood flow to prevent thrombus accumulation severe enough to cause failure of the pump, and,

(e) power means and magnetic actuator means to provide force to rotate said rotor and impeller means thereby pumping the blood.

53. (Amended) An artificial heart, heart assist, or blood pumping device adapted to propel blood therethrough without excessive blood damage or thrombosis by means of rotary hydrodynamic fluid pumping elements, comprising:

(a) inflow and outflow means by which to connect said device to the vascular system,

(b) blood containing housing means including a generally cylindrical tubular segment,

(c) axial flow or mixed flow rotary pump impeller means adapted to pump blood with minimal hemolysis, mechanically supported and rotated by magnetically actuated rotor means,

(d) said magnetically actuated rotor means immersed in blood within said generally cylindrical housing segment, and rotatably supported by mechanical radial bearing means configured such that the exposed junction of the rotating and stationary components thereof is washed by high enough blood flow to prevent thrombus accumulation severe enough to cause failure of the pump,

(e) said rotor means and said generally cylindrical segment of said housing means having therebetween an annular generally cylindrical blood channel through which flows all or part of the blood pumped by the device and across which forces to rotate the impeller are exerted magnetically, and,

(f) power means and magnetic actuator means to provide force to rotate said rotor and impeller means thereby pumping the blood.

54. (Amended) An artificial heart, heart assist, or blood pumping device adapted to propel blood therethrough without excessive blood damage or thrombosis by means of rotary hydrodynamic fluid pumping elements, comprising:

(a) inflow and outflow means by which to connect said device to the vascular system,

(b) blood containing housing means including a generally cylindrical tubular segment,

(c) minimally-hemolytic axial flow, mixed flow, or centrifugal flow rotary pump impeller means, axially separated from, and mechanically supported and rotated by magnetically actuated rotor means,

(d) said magnetically actuated rotor means emersed in blood within said generally cylindrical housing segment, and rotatably supported by bearing means configured such that the exposed junction of the rotating and stationary components thereof is washed by high enough blood flow to prevent thrombus accumulation severe enough to cause failure of the pump,

(e) said rotor means and said generally cylindrical segment of said housing means having therebetween an annular generally cylindrical bladeless blood channel through which all or part of the blood pumped by the device flows without backflow, and across which forces to rotate the rotor are exerted magnetically, and,

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concluded)* (f) power means and magnetic actuator means to provide force to rotate said rotor and impeller means thereby pumping the blood.

85. (Amended) A rotary hydrodynamic blood pump comprising:  
a blood-pumping rotor including an impeller;  
means to suspend the rotor for rotational motion within the bloodstream on a wire in tension that passes through a cylindrical hole in the rotor;  
means to magnetically rotate the rotor within the bloodstream;  
magnetic thrust-bearing means to maintain the rotor in proper axial position on the wire, configured such that the exposed junction of the rotating and stationary components thereof is washed by high enough blood flow to prevent thrombus accumulation severe enough to cause failure of the pump.

90. (Amended) An intraventricular artificial heart comprising:

a hydrodynamic blood pump as defined in Claim 88 of sufficiently small size [and anatomic configuration to be implanted] configured to reside wholly within the chamber of the left ventricle of the natural heart and produce adequate flow and pressure to provide the entire output for the systemic circulation;  
inflow and outflow connector means to permit surgical implantation within the heart;

control means to vary the cardiac output according to the physiological demand of the body and optionally to provide a pulsatile flow by repeatedly speeding up and slowing down the speed of rotation of the impeller.

91. (Amended) An intraventricular artificial heart comprising:

a hydrodynamic blood pump as described in Claim 87 of sufficiently small size [and anatomic configuration to be implanted] configured to reside wholly within the chamber of the left ventricle of the natural heart and produce adequate flow and pressure to provide the entire output for the systemic circulation;

inflow and outflow connector means to permit surgical implantation within the heart;

control means to vary the cardiac output according to the physiological demand of the body and optionally to provide a pulsatile flow by repeatedly speeding up and slowing down the speed of rotation of the impeller.

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Please amend claims 63, 68, 69, 88 and 89 as follows:

Claim 63, line 4, correct the spelling of "produce";

Claim 68, line 10, change "or the motor" to -- of the motor --, and line 11, correct the spelling of "excessively";

Claim 69, line 10, change "or the motor" to -- of the motor --, and line 11, correct the spelling of "excessively";

Claim 88, line 6, after "thereby" insert -- also --; and

Claim 89, line 6, after "thereby" insert -- also --.